

REMARKS

Initial Remarks:

Applicant initially notes with appreciation, the Examiner's indication in the Office Action that Claims 19-43 are allowable. The Examiner has objected to Claims 7-14, indicating that such claims would be allowable if appropriately rewritten. In this regard, new independent Claims 44 and 45 include limitations corresponding with Claims 1 and 7 and Claims 1 and 9, respectively, and therefore Claims 44 and 45 are believed to be in condition for allowance. Further, in accordance with the Office Action, independent Claim 1 and dependent Claims 2-6 and 15-18 stand rejected 35 U.S.C. §102(b). Reconsideration in view of the foregoing amendments and following remarks is respectfully requested.

Objections To The Drawings:

In the Office Action, the Examiner objected to the drawings. Applicant has submitted formal drawings contemporaneously with this paper and therefore respectfully requests that the objections to the drawings be withdrawn.

Objections To The Specification:

In the Office Action, the Examiner objected to the length of the Abstract. In view of the foregoing Amendments to the Abstract, Applicant respectfully requests that such objection be withdrawn.

Rejections under 35 U.S.C. §102(b):

In the Office Action, the Examiner rejected independent Claim 1 contending that independent Claim 1 is anticipated by United States Patent No. 5,658,423 to Angell et al. (Angell). Applicant respectfully disagrees that Angell discloses the inventive combination of features included in independent Claim 1 as presently presented and therefore respectfully traverses the Examiner's rejection of independent Claim 1 and Claims 2-6 and 15-18 depending therefrom. In this regard, as summarized more fully below, Angell does not teach real-time execution of various steps involved in building a model as additional product units are processed.

More particularly, independent Claim 1 is directed to a method for monitoring an

industrial process involving a number of steps: (1) obtaining sensor data corresponding to a plurality of product units being processed in accordance with the industrial process; (2) forming a sample matrix of data representing at least two of the product units, wherein the sample matrix is formed from at least a portion of the sensor data; (3) computing a plurality of singular vectors of the sample matrix; (4) reducing the plurality of singular vectors to a principal set of singular vectors; (5) computing principal components of sensor data corresponding to at least one additional product unit processed subsequent to the product units represented in the sample matrix; (6) computing a predicted data vector for the additional product unit; (7) calculating a residual data vector for the additional product unit using the predicted data vector for the additional product unit and a measured data vector corresponding to the additional product unit, the measured data vector comprising sensor data obtained for the additional product unit; (8) calculating a scalar metric from the residual data vector for the additional product unit; and (9) categorizing the additional product unit based on the value of the scalar metric. Each of the foregoing steps (1) through (9) are performed in real time as additional product units are processed in accordance with the industrial process.

In contrast with Applicant's invention as claimed in independent Claim 1, Angell discloses a method of monitoring the status of plasma in a semiconductor wafer processing chamber in which a reference model is generated and then the previously generated reference model is used to monitor the process in real-time as further wafers are processed. See Angell column 5, lines 39-43. The process steps involved in the model generation portion of Angell's method involve collecting reference spectra from the process (10), performing a principal component analysis (PCA) (20), calculating percent variation included the principal components (30), calculating confidence limits for the PCA model (40), and generating a final PCA model P (50). See Angell FIG. 2A and column 5, line 45 through column 7, line 14. The real-time monitoring portion of Angell's method involves collecting real-time spectra Y from the process (60), forward projecting spectra Y using the model P (70), reconstructing the original Y by back projection (80), calculating the residual R (90), and displaying the results in a control chart format (100). See Angell FIG. 2B and column 7, lines 15-49.

Thus, as taught by Angell, the model generation steps (10) through (50) are performed and thereafter the process monitoring steps (60) through (100) are executed to monitor the

process in real time as further wafers are processed. Of significance, Angell does not teach performing the model generation steps (10) through (50) during real-time monitoring of the process. This differs from Applicant's invention as claimed in independent Claim 1. In this regard, all of the steps of Claim 1, including steps (2) through (4) of Claim 1 in which a sample matrix is formed and singular vectors thereof are computed and reduced to a principal set of singular vectors, are performed in real-time during processing of additional product units. Thus, in accordance with Claim 1, model generation and monitoring of the process are performed in conjunction with one another while additional product units are processed. Since Angell does not teach or reasonably suggest such a method, independent Claim 1 is in condition for allowance.

Conclusion

Since the remaining rejected claims depend directly or indirectly from Claim 1, there is no need to separately address the patentability of such claims. Thus, in view of the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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